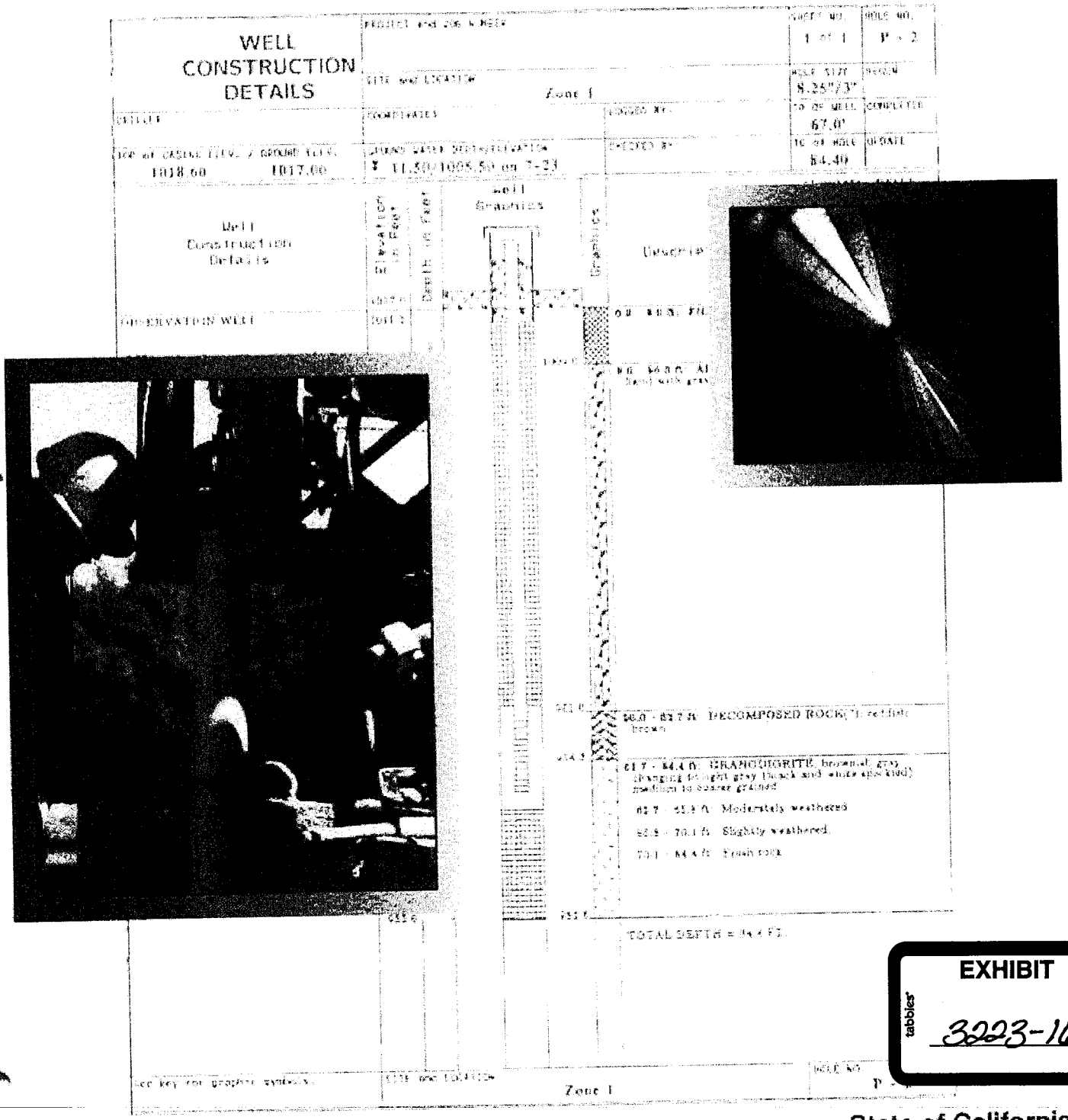
Monitoring Well Design and Construction for Hydrogeologic Characterization

Guidance Manual for Ground Water Investigations



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State of California
Environmental Protection Agency

MONITORING WELL DESIGN AND CONSTRUCTION FOR HYDROGEOLOGIC CHARACTERIZATION

Guidance Manual for Ground Water Investigations

July 1995

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State of California

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The California Environmental Protection Agency:

Department of Toxic Substances Control
State Water Resources Control Board
Integrated Waste Management Board
Air Resources Board
Department of Pesticide Regulation
Office of Environmental Health Hazard Assessment

FOREWORD

The California Environmental Protection Agency (Cal/EPA) is charged with the responsibility of protecting the state's environment. Within Cal/EPA, the Department of Toxic Substances Control (DTSC) has the responsibility of managing the state's hazardous waste program to protect public health and the environment. The State Water Resources Control Board and the nine Regional Water Quality Control Boards (RWQCBs), also part of Cal/EPA, have the responsibility for coordination and control of water quality, including the protection of the beneficial uses of the waters of the state. Therefore, the RWQCBs work closely with DTSC in protecting the environment.

To aid in characterizing and remediating hazardous substance release sites, DTSC had established a technical guidance work group to oversee the development of guidance documents and recommended procedures for use by its staff, local governmental agencies, responsible parties and their contractors. The Geological Support Unit (GSU) within DTSC provides geologic assistance, training and guidance.
This document was prepared by GSU staff in cooperation with the technical guidance work group and the RWQCBs. This document has been prepared to provide guidelines for the investigation, monitoring and remediation of hazardous substance release sites. It should be used in conjunction with the two-volume companion reference for hydrogeologic characterization activities:

Guidelines for Hydrogeologic Characterization of Hazardous Substances Release Sites
Volume 1: Field Investigation Manual
Volume 2: Project Management Manual

Please note that, within the document, the more commonly used terms, *hazardous waste site* and *toxic waste site*, are used synonymously with the term hazardous substance release site. However, it should be noted that any unauthorized release of a substance, hazardous or not, that degrades or threatens to degrade water quality may require corrective action to protect its beneficial use.

This document supersedes the 1990 draft of the DTSC *Scientific and Technical Standards for Hazardous Waste Sites, Volume 1, Chapter 8*, and is one in a series of Cal/EPA guidance documents pertaining to the remediation of hazardous substance release sites.

ACKNOWLEDGEMENTS

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Steve Belluomini	Supervising Hazardous Substances Engineering Geologist I,
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Members of the technical guidance work group participated in the development of this document by providing comments and direction. Additional review and comments were provided by the Regional Water Quality Control Boards and Dennis Parfitt of the State Water Resources Control Board. We thank them for their cooperation and helpful suggestions.

Finally, thanks are extended to the staff of the Geological Support Unit, and to the many anonymous reviewers outside DTSC, whose comments were indispensable for completing this document.

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have been show to adversely affect the integrity of ground-water samples. (See Aller et al., 1989 for a summary of relevant research.)

2.5 Well Intake Design

The RP should design and construct the intakes of monitoring wells to (1) accurately sample the aquifer zone the well is intended to sample; (2) minimize the passage of formation materials (turbidity) into the well; and (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

2.5.1 Well Screen

The goal of a properly completed monitoring well is to provide low turbidity water that is representative of ground-water quality in the vicinity of the well. Monitoring wells completed in rock often do not require screens, though wells completed in unconsolidated sediments do require screens.

Screen Length

The selection of screen length usually depends on the objective of the well. Piezometers, for example, are generally completed using short screens (2 feet or less), as are wells where only a discrete flow path, such as thin gravel interbedded with clays, is monitored. To avoid dilution, well screens should be kept to the minimum length appropriate for intercepting a contaminant plume, especially in a high-yielding aquifer. The screen length should generally not exceed 10 feet. If construction of a water table well is the objective, either for defining flow gradient or detecting the presence of floating non-aqueous phase liquid (NAPL), then a longer screen spanning the water table is acceptable, to account for NAPL's or seasonal water table fluctuations. The RP should not use screen lengths that create a conduit for contaminant transport across hydraulically separated geologic units.

Screen Slot Size

Well screen slot size should be selected to retain at least 90% of the filter pack material (discussed below) in artificially filter packed wells, or a minimum of 50% of the formation material in naturally packed wells, unless the RP can demonstrate that turbidity-free water (<5 nephelometric turbidity units) can be obtained using a larger slot size. Although this is a higher percentage than is usually required in a production well, the low withdrawal rates and the infrequent use of a monitoring well necessitate the higher percentage exclusion. Cal EPA emphasizes that filtering a sample subsequent to its collection is not the solution for dealing with turbidity in an improperly designed well. Furthermore, well screens should be factory-slotted. Manually slotting casing as a substitute for screens should not be accepted under any conditions.

2.5.2 Filter Packs/Pack Material

The annular space between the borehole wall and the screen or slotted casing should be filled in a manner that minimizes the passage of formation materials